Important

This Technical Data Sheet and the corresponding Installation Instructions provide important information to ensure the installed engine will operate according to the design specification in the Volvo Penta application for certification.

Requirements marked with ⚠ are considered as critical for exhaust emissions compliance according to the design specification in the Volvo Penta application for certification.

Failing to follow and meet these instructions and requirements when installing a certified engine in a piece of nonroad equipment for use in the United States violates U.S. federal law (40 CFR 1068.105(b)), subject to fines or other penalities as described in the Clean Air Act.

General

In-line four stroke diesel engine with direct injection. Rotation direction, anti-clockwise viewed towards flywheel

Number of cylinders			6
Displacement, total		liters in^3	7,70 470
Firing order			1-4-2-6-3-5
Bore		mm in	110 4,33
Stroke		mm in	135 5,31
Compression ratio			17.5:1
Wet weight (Not including after treatment system)	Engine only	kg lb	737 1625
	Power pac	kg lb	947 2088

Performance				**rpm**	**1500**	**1800**	**2000**	**2200**
ICFN Power 160 kW		without fan		kW hp	160 218	160 218	160 218	160 218
		with fan 650 mm pull		kW hp	153 208	149 203	149 203	149 203
Torque at:		ICFN Power 160 kW		Nm lbf ft	1020 752	849 626	764 563	695 513
Max torque at engine speed	ICFN Power		1200 rpm	Nm lbf ft	1060 782			
Power tolerance				%	±3			
Mean piston speed				m/s ft/sec	6,8 22,1	8,1 26,6	9,0 29,5	9,9 32,5
Effective mean pressure at:		ICFN Power 160 kW		MPa psi	1,66 241	1,39 201	1,25 181	1,13 164
Total mass moment of inertia, J (mR^2) (not including flywheel)				kgm^2 $lbft^2$	0,398 9,4			
Friction Power				kW hp	17 23	23 31	29 39	35 48
Derating see Technical Diagrams								

Engine brake performance (only engines with engine brake)		rpm	1500	2200	2500	2800
Brake power:	without fan	kW	70	121	145	170
		hp	95	165	197	231
Brake torque:	without fan	Nm	448	524	555	580
		lbf ft	330	386	409	428
Engine speed range for engine brake activation:		rpm	900-2800			
Min engine speed with engine brake still active:		rpm	900			
Min oil temperature for engine brake activation:		°C	55			

Cold start performance

*Cold start limit temperature	without starting aid	°C °F	-15 5	
	with manifold heater 4 kW	°C °F	-30 -22	
	with manifold heater 4 kW and block heater	°C °F	-35 -31	
*Specify oil quality	Above -15°C; 15W40 Above -25°C; 10W30 Below -25°C; 5W30			
Block heater type	Make	Power kW	Engaged hours	Cooling water temp engine block
	Volvo	1,5		

* See also general section in the sales guide

Lubrication system

Lubricating oil consumption (average)			Vol%	0,05
Oil system capacity including filters			liter US gal	27 7,13
Oil pan capacity:		Max	liter US gal	24 6,34
		Min	liter US gal	19 5,02
Oil change intervals/specifications	VDS4, VDS4.5		h	500
			h	
Engine angularity limits:	front up		°	40
	front down		°	45
	side tilt		°	40
Oil pressure at rated power			kPa psi	425 62

Lubrication system

Lubrication oil temperature in sump:	max	°C °F	125 257
Oil filtration efficiency (in accordance with ISO 4548-12)	97%	µ	36
	50%	µ	14

Fuel system		rpm	1500	1800	2000	2200
Urea consumption (vol% of diesel consumption)		vol%	7%			
Fuel to conform to			EU EN590 US D975, 1-D and 2-D (Max 15ppm sulphur and 7% FAME)			
System supply flow at max. speed		liter/h US gal/h	122 32,2			
Fuel supply line max. restriction (Measured at fuel inlet connection)		kPa psi	25 3,6			
Fuel supply line max. pressure, during engine stand still (meassured at fuel inlet connection)		kPa psi	20 2,9			
System return flow at max. speed		liter/h US gal/h	60,0 15,9			
Fuel return line max. restriction (Measured at fuel return connection)		kPa psi	15 2,2			
Max. allowable inlet fuel temp (Measured at fuel inlet connection)		°C °F	80 176			
Prefilter / Water separator filtration efficiency	99%	µ	30			
Main fuel filter filtration efficiency (in accordance with ISO 19438)	98%	µ	5			
	96%	µ	4			
Governor type/make, standard		Volvo/ EMS 2.3				
Injection pump type/make		Denso HP4				

Intake and exhaust system		Inlet air temp	rpm	1500	1800	2000	2200
Charge air consumption at: (+25°C and 100kPa)	ICFN Power 160 kW	25°C	m³/min	10,8	11,4	14,1	14,6
		77°F	cfm	381	403	498	516
⚠ **See front page for important information** Max allowable air intake restriction including piping			kPa psi	6 0,9			
Heat rejection to exhaust at:	ICFN Power 160 kW		kW BTU/min	81 4606	89 5073	98,7 5613	101,1 5749
Exhaust gas temperature after turbine at:	ICFN Power 160 kW		°C °F	360 680	374 705	344 651	340 644
⚠ **See front page for important information** Max allowable back pressure in exhaust line (after turbine) Pipe dimension Ø: 102 mm			kPa psi	14 2,0	16 2,3	20 2,9	21 3,0
⚠ **See front page for important information** Max allowable temperature drop between turbine and SCR muffler inlet.			Δ°C Δ°F	15 27			
SCR muffler pressure drop (at exhaust gas flow and exhaust temp given)			kPa psi	9 1,3	11 1,6	12 1,7	13 1,9
Exhaust gas flow at: (temp and pressure after turbine at the corresponding power setting)	ICFN Power 160 kW		m³/min cfm	21,6 763	23,0 812	25,6 904	26,3 929

Cooling system			rpm	1500	1800	2000	2200
Heat rejection radiation from engine at:		ICFN Power 160 kW	kW BTU/min	5 273	5 262	3,9 222	3,8 216
Heat rejection to coolant at:		ICFN Power 160 kW	kW BTU/min	105 5954	112 6352	108,2 6153	120,2 6836
Radiator cooling system type				Closed circuit			
Standard radiator core area		ICFN Power 160 kW	m² foot²	0,6 6,46			
Fan diameter	650 mm	ICFN Power 160 kW	mm in	650 25,59			
Maximum fan power consumption	650 mm pull		kW hp	7,2 10	10,8 15	10,8 15	10,8 15
Fan drive ratio	fan Ø650			1:1.4			
	fan position high			1:1.1			
Coolant capacity:	engine		liter US gal	17 4,5			
	engine + standard radiator, hoses and expansion tank		liter US gal	51 13,5			
Coolant pump			drive/ratio	belt/1,40:1			
Coolant flow with standard system			l/s US gal/s	5,4 1,4	6,5 1,7	7,2 1,9	8,0 2,1
Minimum coolant flow			l/s US gal/s				6,0 1,6
Maximum outer circuit restriction incl. piping			kPa psi	40,0 5,8			
Thermostat:		start to open	°C °F	85 185			
		fully open	°C °F	95 203			
Maximum static pressure head (expansion tank height + pressure cap setting)			kPa psi	110 16,0			
Minimum static pressure head (expansion tank height + pressure cap setting)			kPa psi	85 12,3			
Standard pressure cap setting			kPa psi	100 14,5			
Maximum top tank temperature			°C °F	107 225			
Recommended Draw down capacity. The difference between min coolant level in the expansion tank and the lowest level where the engine's coolant system still are functioning			liter US gal	2 0,5			

Charge air cooler system		rpm	1500	1800	2000	2200
Heat rejection to charge air cooler	ICFN Power 160 kW	kW	24,9	23,1	30	31,7
		BTU/min	1416	1314	1706	1803
Charge air mass flow	ICFN Power 160 kW	kg/s	0,212	0,224	0,276	0,286
Charge air inlet temp. (Charge air temp after turbo compressor)	ICFN Power 160 kW	°C	164	150	157	159
		°F	327	302	315	318
⚠ **See front page for important information** Max allowable Charge air outlet temp. (Charge air temp after charge air cooler)		°C	48	48	50	50
		°F	118	118	122	122
⚠ **See front page for important information** Maximum pressure drop over charge air cooler incl. piping		kPa	6	7	11	12
		psi	0,87	1,02	1,60	1,74
Charge air pressure (relative) (After charge air cooler)		kPa	177	154	159	160
		psi	25,67	22,34	23,06	23,21
Standard charge air cooler core area		m²	0,5			
		foot²	5,38			

Cooling performance: 0,6 m² radiator and 650mm fan, pull

Cooling air flow and maximum additional external restriction at different radiator air temperatures based on 107°C TTT and 40% coolant. Valid at 1 atm.

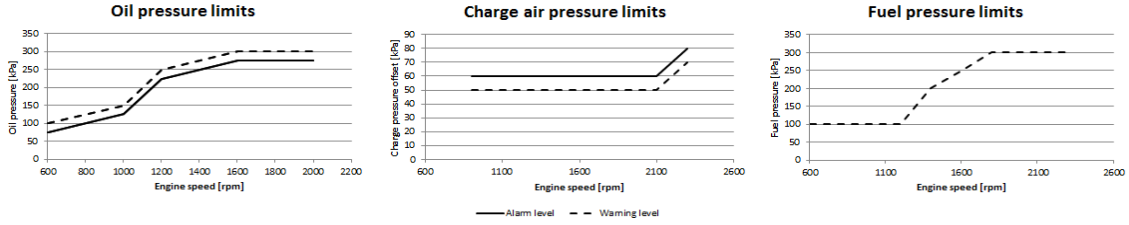
		ICFN Power 160 kW					
Engine speed	Engine power	Air on temp		Air flow		External restriction	
rpm	kW hp	°C	°F	m^3/s	ft^3/s	Pa	psi
1500	160	65	148	7,5	264,9	0	
	218	64	147	7,3	257,8	100	0,015
		62	143	6,8	240,1	200	0,029
		58	137	6,2	219,0	300	0,044
2200	160	68	154	9,5	335,5	0	
	218	67	153	9,4	332,0	100	0,015
		67	152	9,1	321,4	200	0,029
		65	150	8,7	307,2	300	0,044

Engine management system

Functionality	Alternatives			Default setting
Governor mode	Droop	Isochronous		Isochronous
Governor droop	10	125	Nm/rpm	
Governor response	Adjustable PI constants			
Idle speed	600	800	rpm	600
Stop function				Replaced by "Ignition of stop engine"
Preheating function	Ignition	Request	Request + temp	If preheat is available, preheat will be active at ignition on if temp low or demanded by driver.
Lamp test				No lamp test, not used any longer
Ignition of stop engine	Yes	No		No

Engine sensors and switch settings			Alarm level		Engine protection	
Parameter		**Unit**	**Setting range**	**Default setting**	**Level**	**Action. Default/Alternative**
Oil temp		°C		125	125	Derate/Shut down
Oil pressure	Low idle	kPa		75,0	75	Shut down.
	Rated speed	kPa		275	275	Shut down.
Oil level				Low level		
Coolant temp		°C		107	107	Derate/Shut down
Coolant level			See cooling system	On	Low level	Derate/Shut down
Fuel feed pressure	Low idle	kPa		100		
	Rated speed			300		
Water in fuel				Alarm when closed		
EGR temp		°C		210	210	Derate/Shut down
Air filter pressure drop				5kPa		
Altitude, above sea		m			700	Automatic derating, see section derating
Charge air temp		°C		120	120	Derate/Shut down
Charge air pressure		kPa		Alarm map value	Alarm map value	Derate/Shut down
SCR temp		°C		515	515	Derate

Parameter	Warning	Alarm	Derated 0% to engine protection map	Derated 100% to engine protection map	Forced idle after 5 sec	Forced shut down after 0 sec
Coolant temp	102°C	107°C	107°C	112°C		
Oil temp	120°C	125°C	125°C	130°C		
Low oil pressure	Warning map value	Alarm map value				Alarm map value
High charge air temp	115°C	120°C	120°C	140°C		
High charge air pressure	Warning map value	Alarm map value		Alarm map value		
EGR temp	200°C	210°C	210°C	220°C		



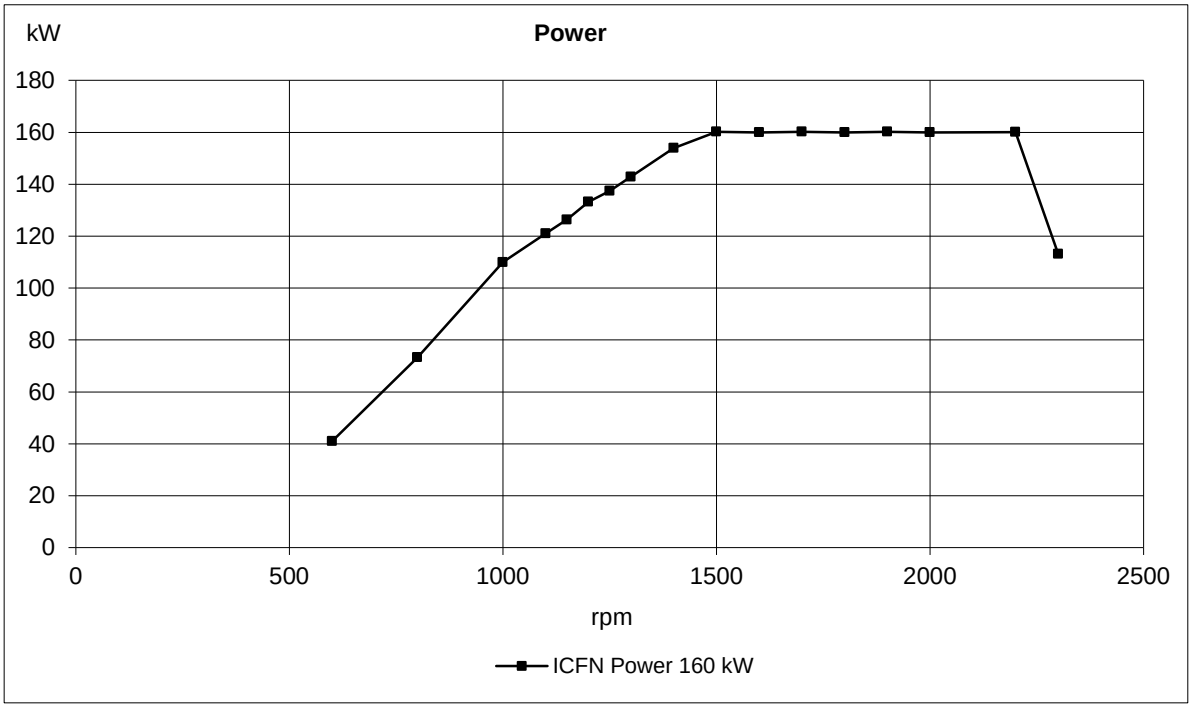
Electrical system

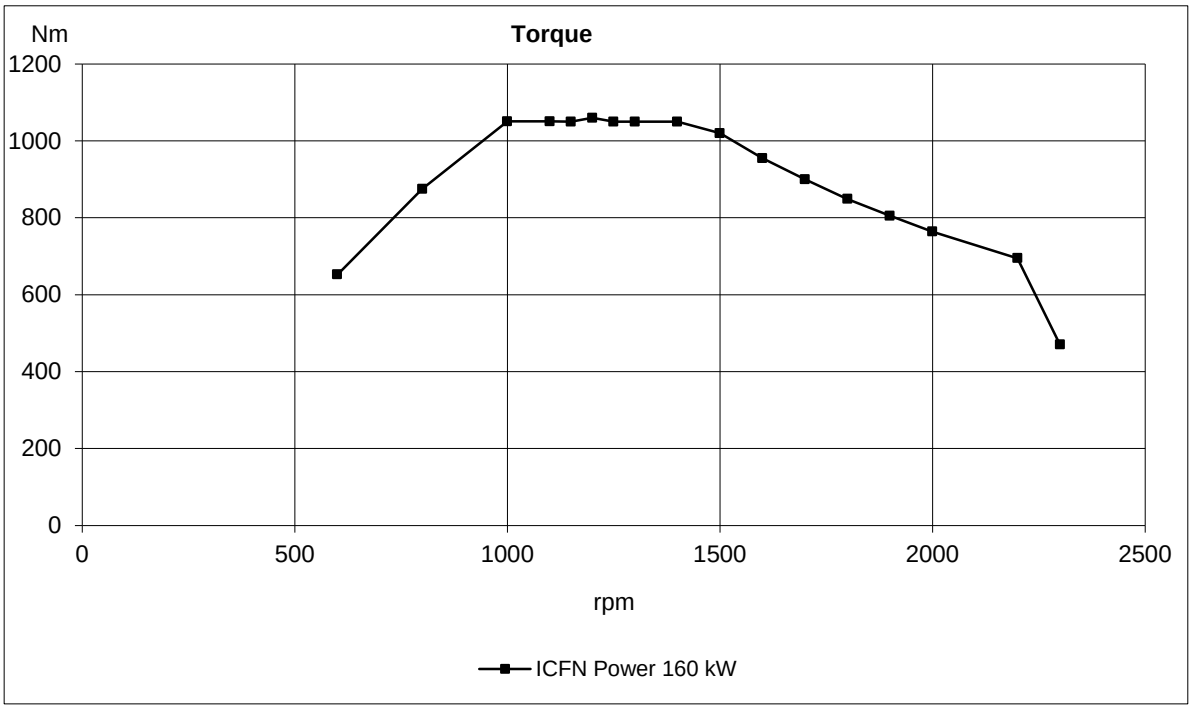
Voltage and type				24V
Alternator:	make			MELCO
	output	A		110/130
	tacho output	Hz/alternator rev.		
	drive ratio			
Starter motor:	make			MELCO
	type			85P50/90P55
	output		kW	5 / 5.5
			hp	6.8 / 7.5
Number of teeth on:	flywheel			137
	starter motor			10 / 12 teeth
Inlet manifold heater (at 20 V)			kW	4
Power relay for the manifold heater			A	200

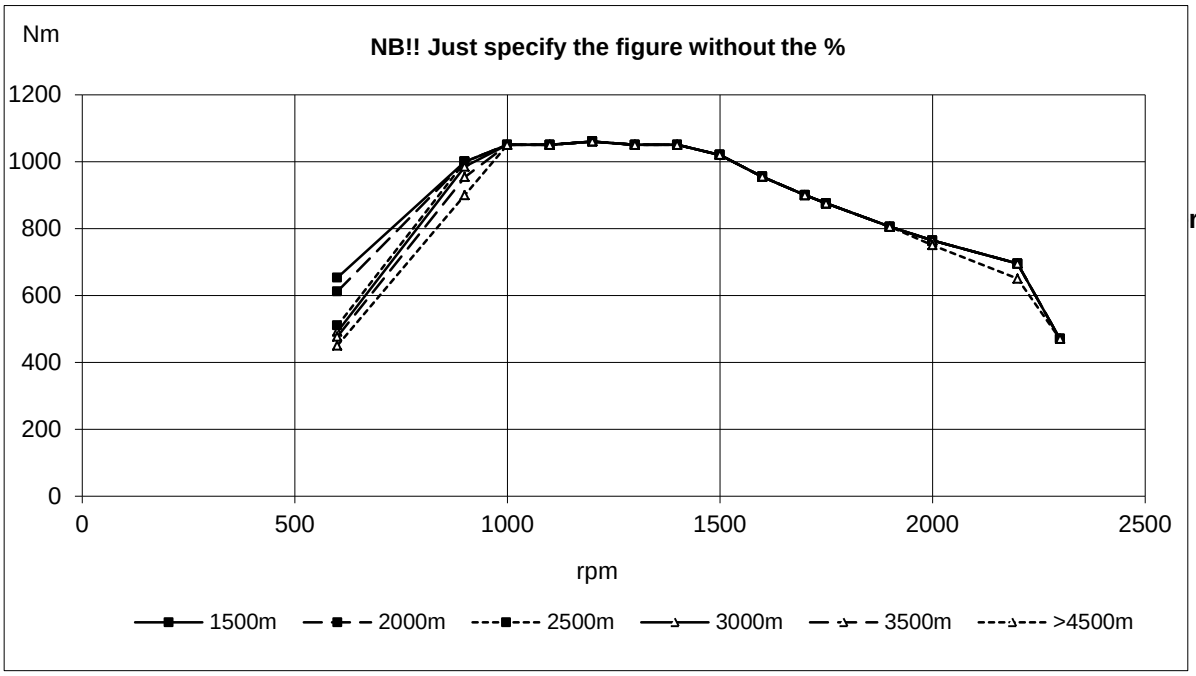
Conditions: (5 mΩ main circuit resistance@ 20°C)	**Temperature**	**°C**		**25**	**0**	**-15**
	Battery	**Ah / CCA**		**140/800**	**140/800**	**140/800**
Crank speed		rpm		185	160	120
Crank current		A		220	300	470
Starter input power during crank		kW		4,91	5,90	6,94
Battery power during crank		kW		5,15	6,31	7,50
Min battery @ 0°C		Ah / CCA		100/700		

Power take off			**rpm**	**1400**	**1800**	**2000**	**2200**
Front end in line with crank shaft max:*		0.02 kgm^2	Nm	1064,0	743,0	740	833
Flywheel			lbf ft	785	548	546	614
SAE 2, STD 10" & 11,5 ", 1.303 kgm2		0.03 kgm^2	Nm	1030,0	706,0	697	786
			lbf ft	760	521	514	580
		0.04 kgm^2	Nm	996,0	663,0	654	729
			lbf ft	735	489	482	538
Front end belt pulley load.	Max up (above or equal to horizontal line)		kW	12,5	16	18,8	19,6
			hp	17,0	21,8	25,6	26,7
	Max down (below horizontal line)		kW	26,6	34,2	38	41,8
			hp	36,2	46,5	51,7	56,8
Maximum power on Rear PTO on top of flywheel housing(REPTO):*			kW	75			
			hp	102			
Speed ratio direction of rotation viewed from flywheel side				1:1 Counter clockwise			
Maximum torque on PTO at compressor position:*			Nm	200			
			lbf ft	148			
Speed ratio direction of rotation viewed from flywheel side				1.026:1 Counter clockwise			
Timing gear at hydraulic pump PTO max:*			Nm	80			
			lbf ft	59			
Speed ratio direction of rotation viewed from flywheel side				1.3:1 Clockwise			
Max allowed bending moment in flywheel housing		SAE2	Nm	4600			
			lbf ft	3393			
Max. rear main bearing load			N	4250			
			lbf	955,4			

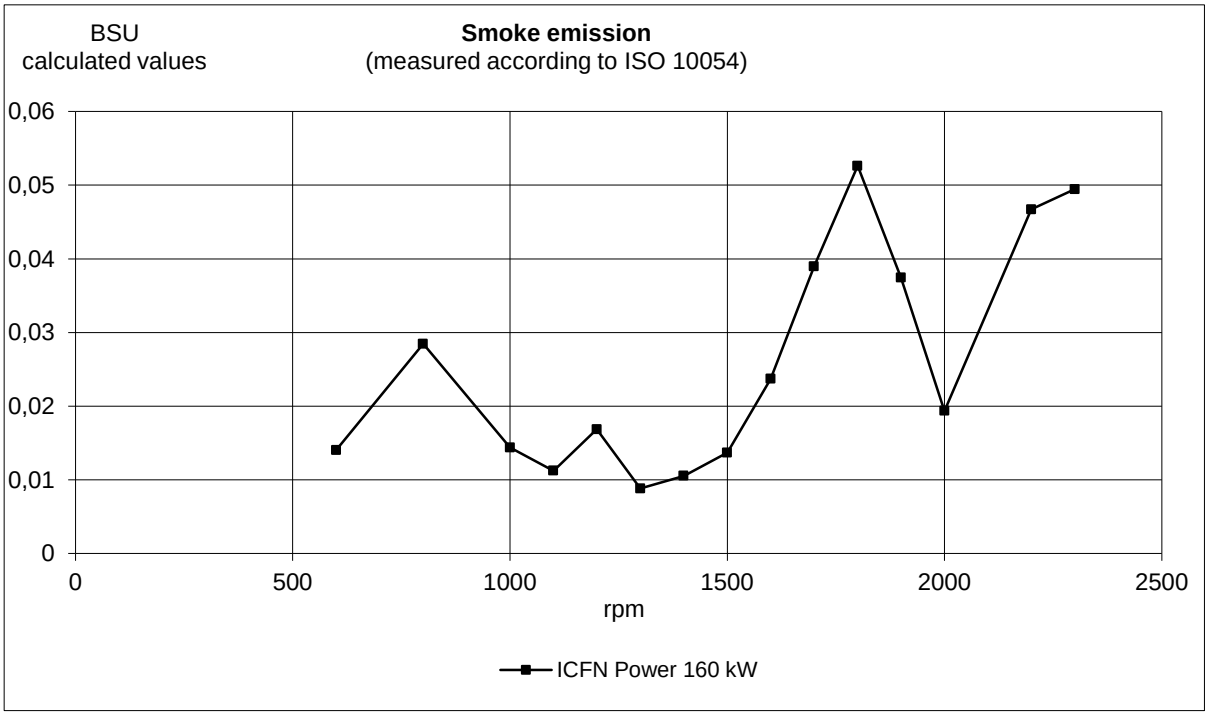
**** Maximum allowed torque at individual PTO´s.***
If more then one PTO output is used simultaniusly, calculations needs to be performed to determine available maximum. Available torque depends on application inertia.

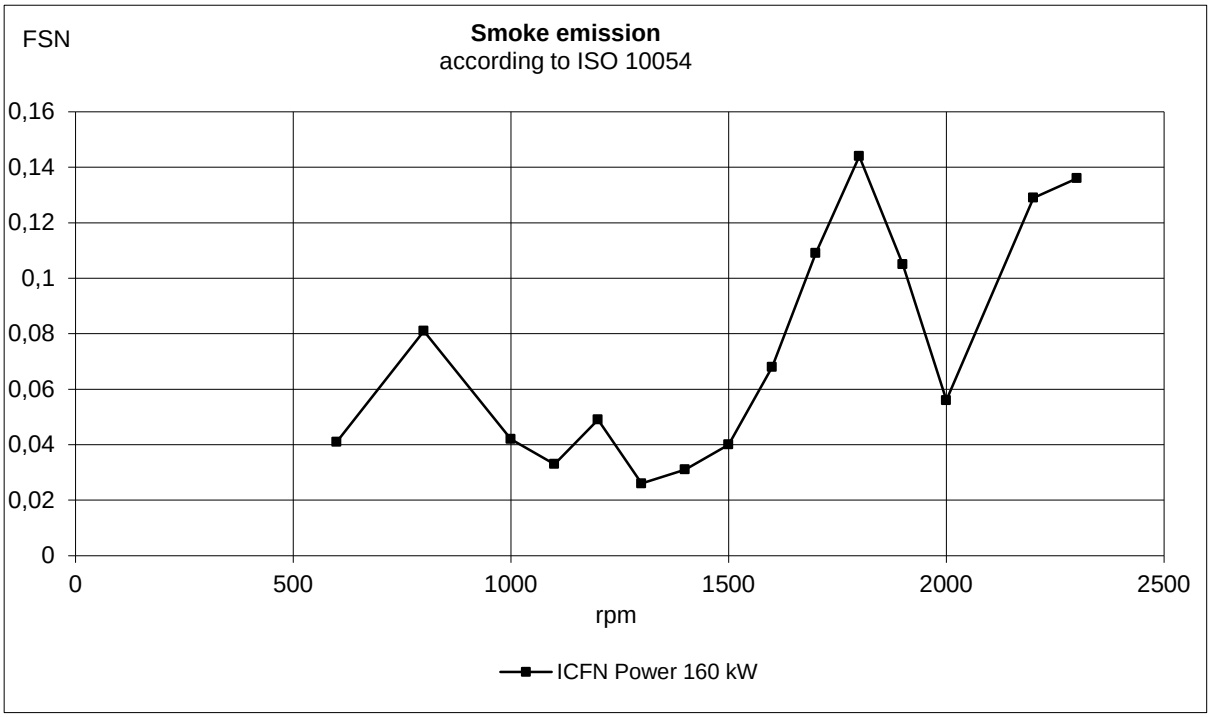

kW
Power
180
160
140
120
100
80
60
40
20
0
0
500
1000
1500
2000
2500
rpm
ICFN Power 160 kW

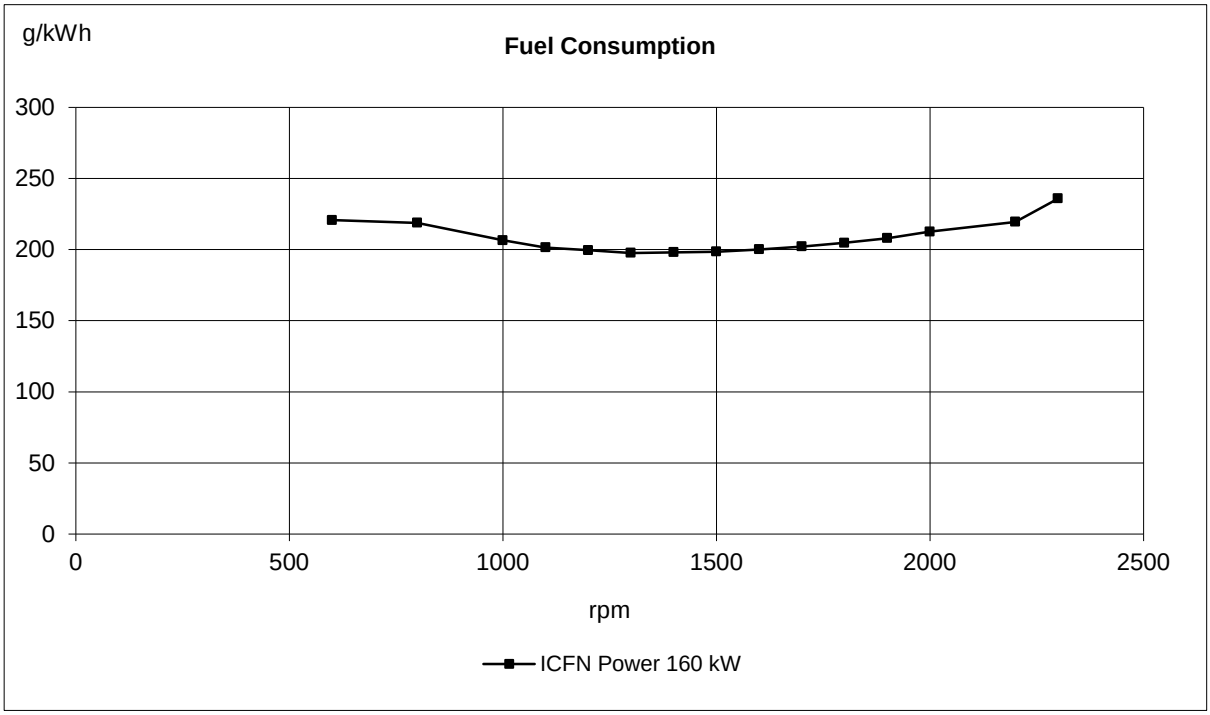

Nm
Torque
1200
1000
800
600
400
200
0
0
500
1000
1500
2000
2500
rpm
ICFN Power 160 kW

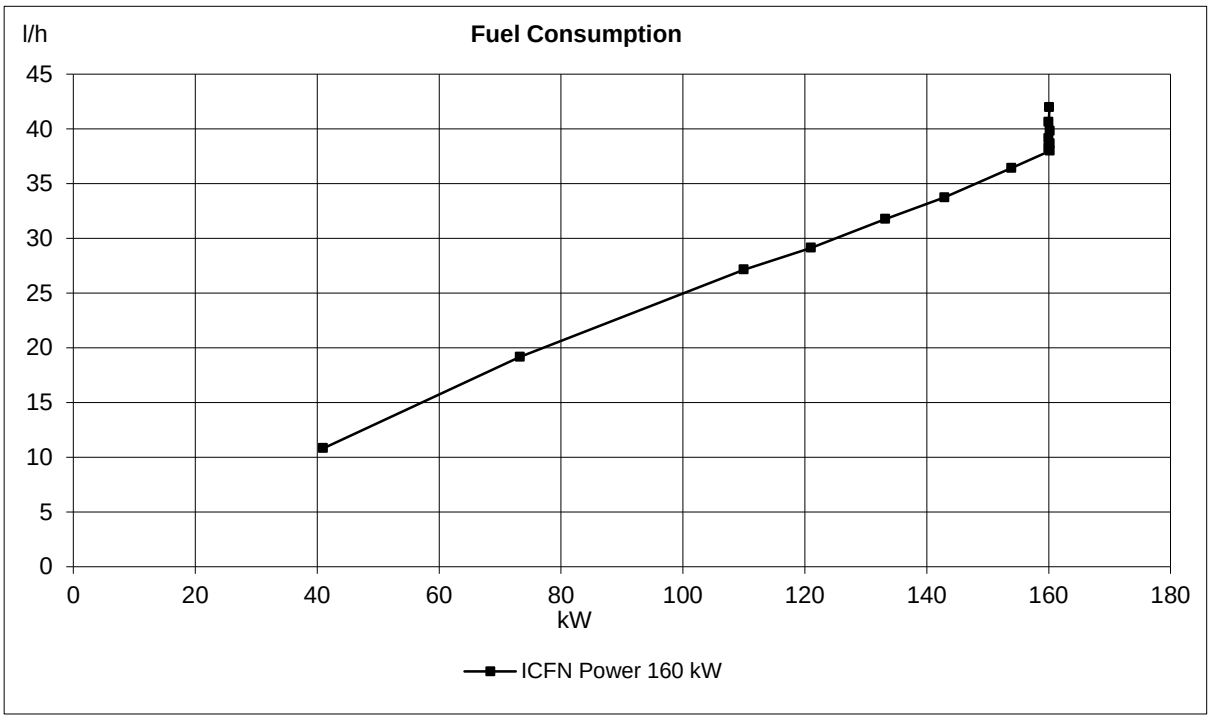

Nm
NB!! Just specify the figure without the %
1200
1000
800
600
400
200
0
0
500
1000
1500
2000
2500
rpm
1500m
2000m
2500m
3000m
3500m
>4500m

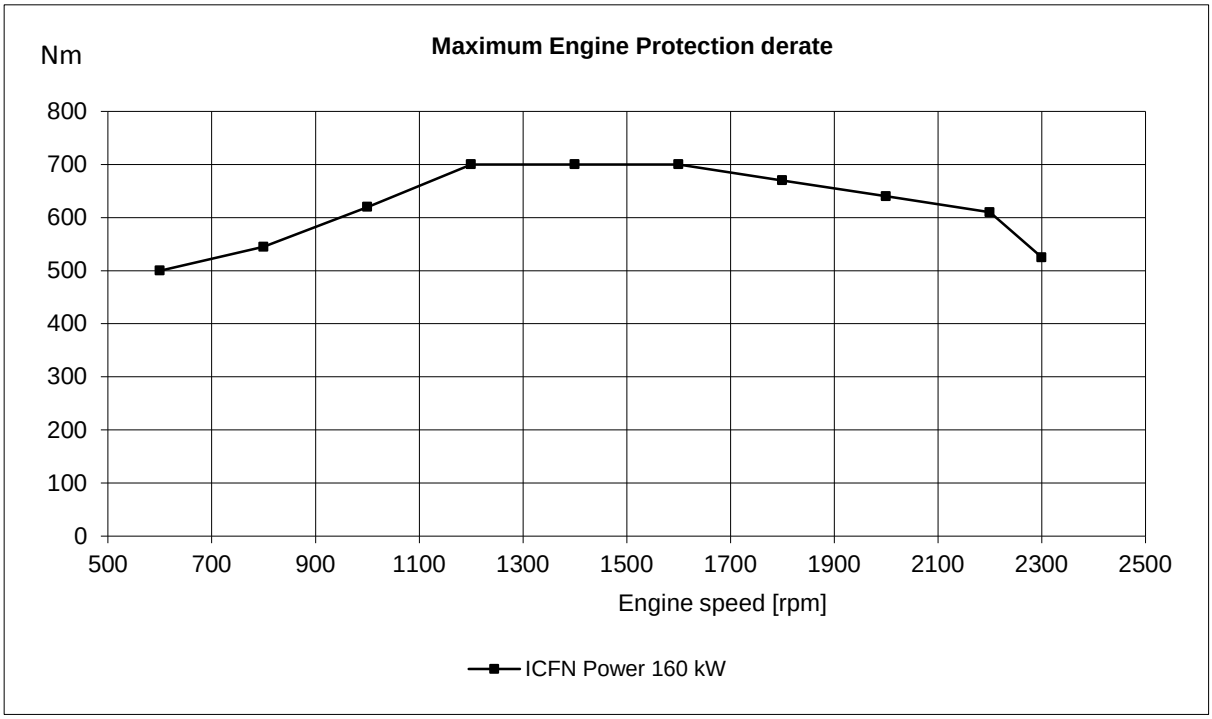
rat

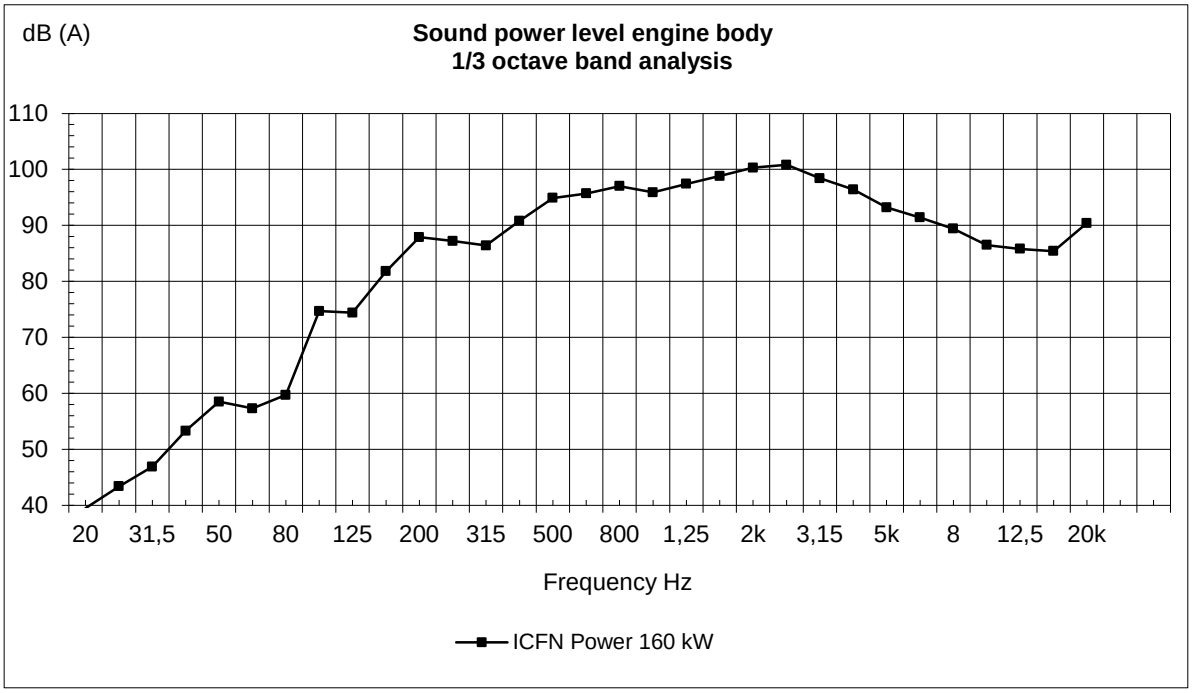

BSU
calculated values
Smoke emission
(measured according to ISO 10054)
0,06
0,05
0,04
0,03
0,02
0,01
0
0
500
1000
1500
2000
2500
rpm
ICFN Power 160 kW

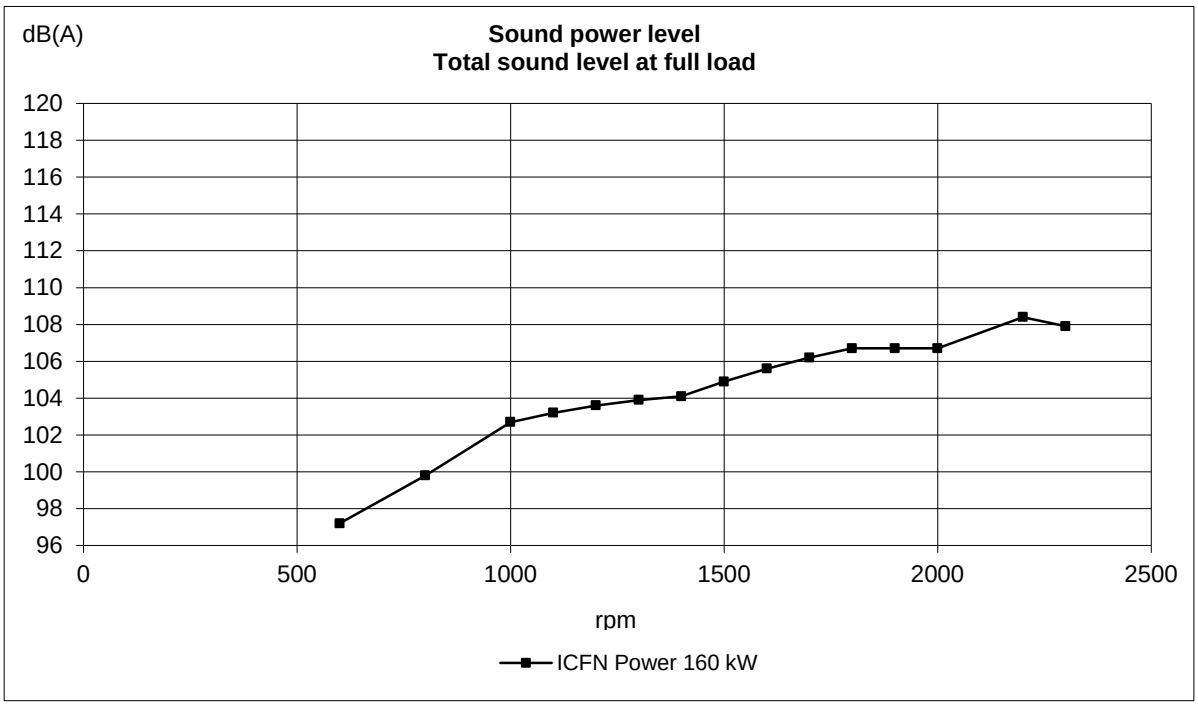

FSN
Smoke emission
according to ISO 10054
0,16
0,14
0,12
0,1
0,08
0,06
0,04
0,02
0
0
500
1000
1500
2000
2500
rpm
ICFN Power 160 kW

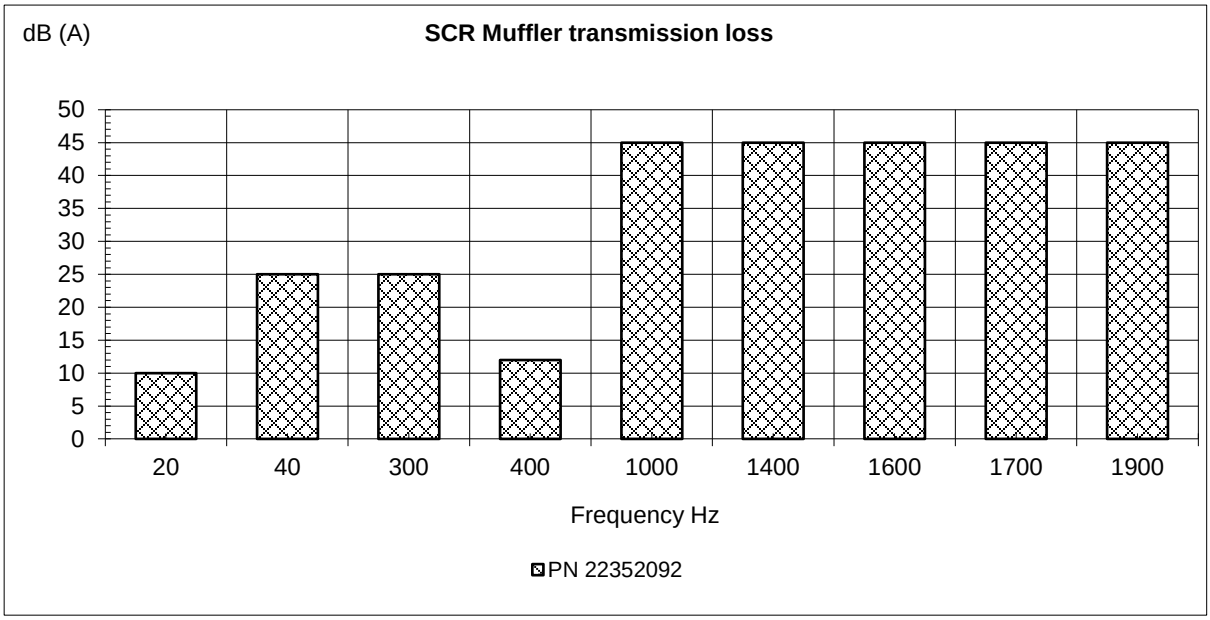

g/kWh
Fuel Consumption
300
250
200
150
100
50
0
0
500
1000
1500
2000
2500
rpm
ICFN Power 160 kW

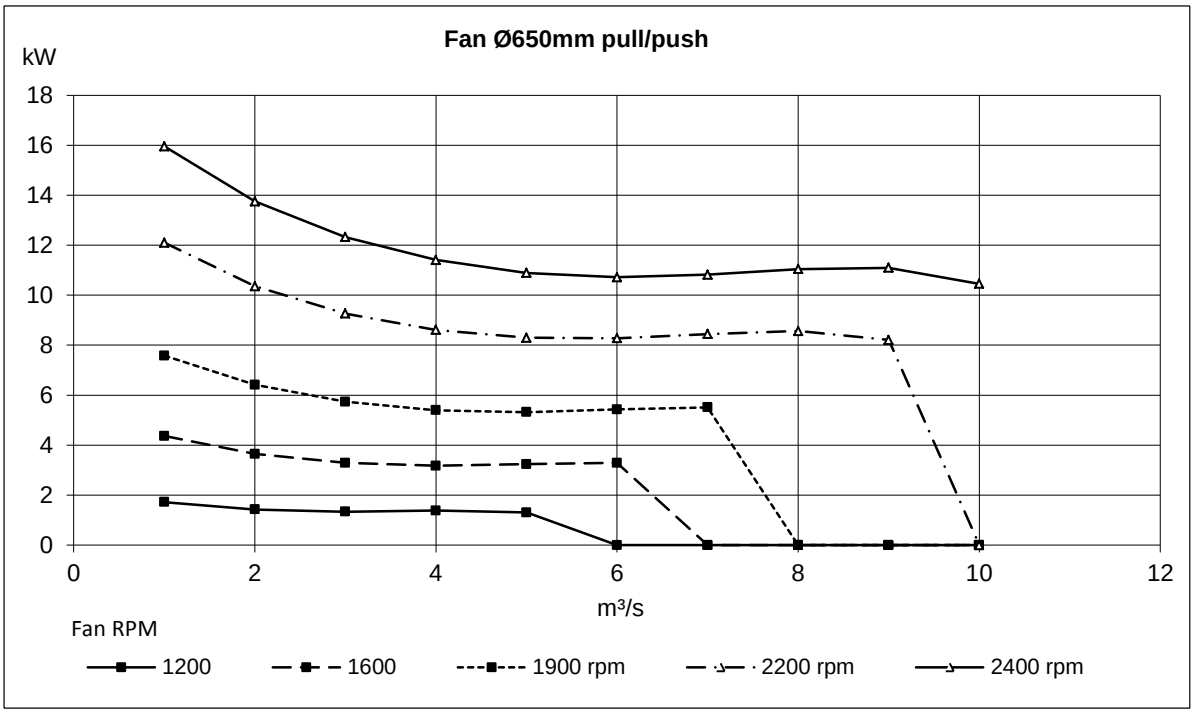

l/h
Fuel Consumption
45
40
35
30
25
20
15
10
5
0
0
20
40
60
80
100
120
140
160
180
kW
ICFN Power 160 kW


Maximum Engine Protection derate
Nm
800
700
600
500
400
300
200
100
0
500
700
900
1100
1300
1500
1700
1900
2100
2300
2500
Engine speed [rpm]
ICFN Power 160 kW

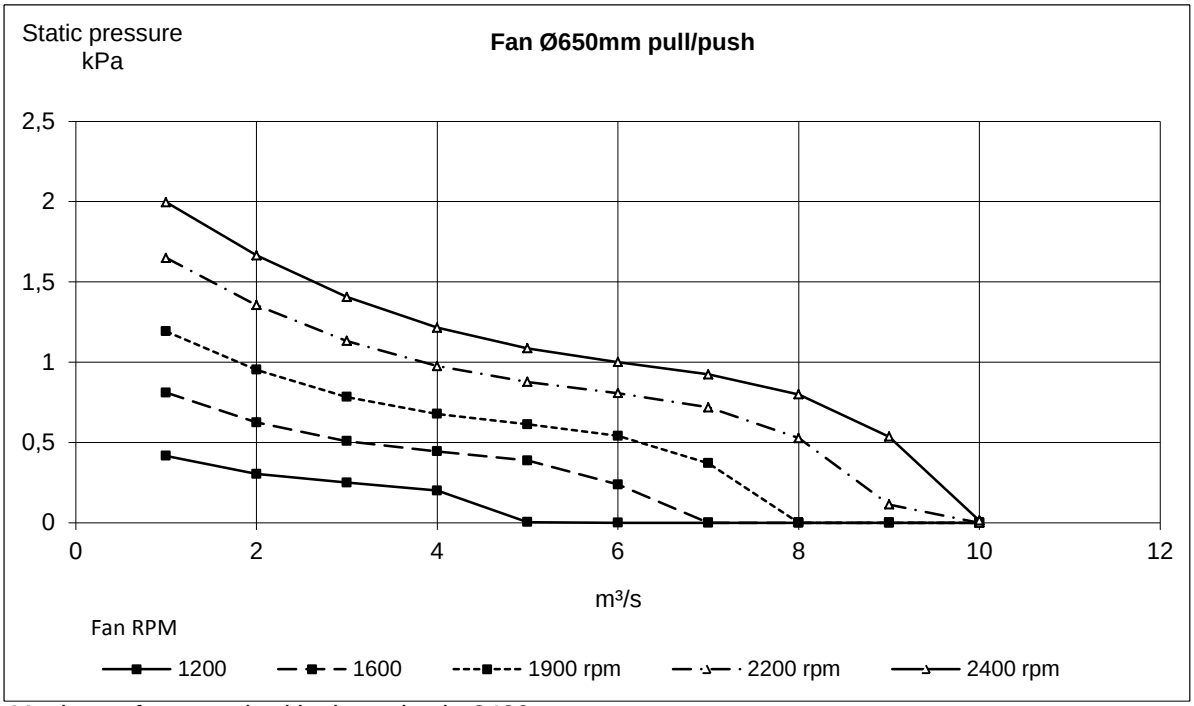

dB (A)
Sound power level engine body
1/3 octave band analysis
110
100
90
80
70
60
50
40
20
31,5
50
80
125
200
315
500
800
1,25
2k
3,15
5k
8
12,5
20k
Frequency Hz
ICFN Power 160 kW


dB(A)
Sound power level
Total sound level at full load
120
118
116
114
112
110
108
106
104
102
100
98
96
0
500
1000
1500
2000
2500
rpm
ICFN Power 160 kW

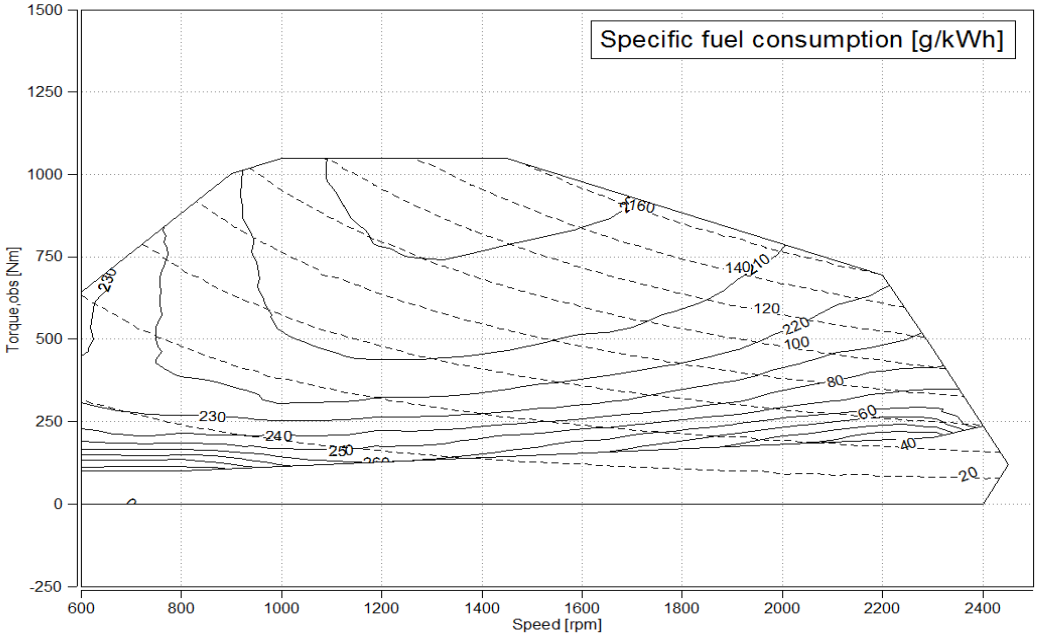

dB (A)
SCR Muffler transmission loss
50
45
40
35
30
25
20
15
10
5
0
20
40
300
400
1000
1400
1600
1700
1900
Frequency Hz
PN 22352092

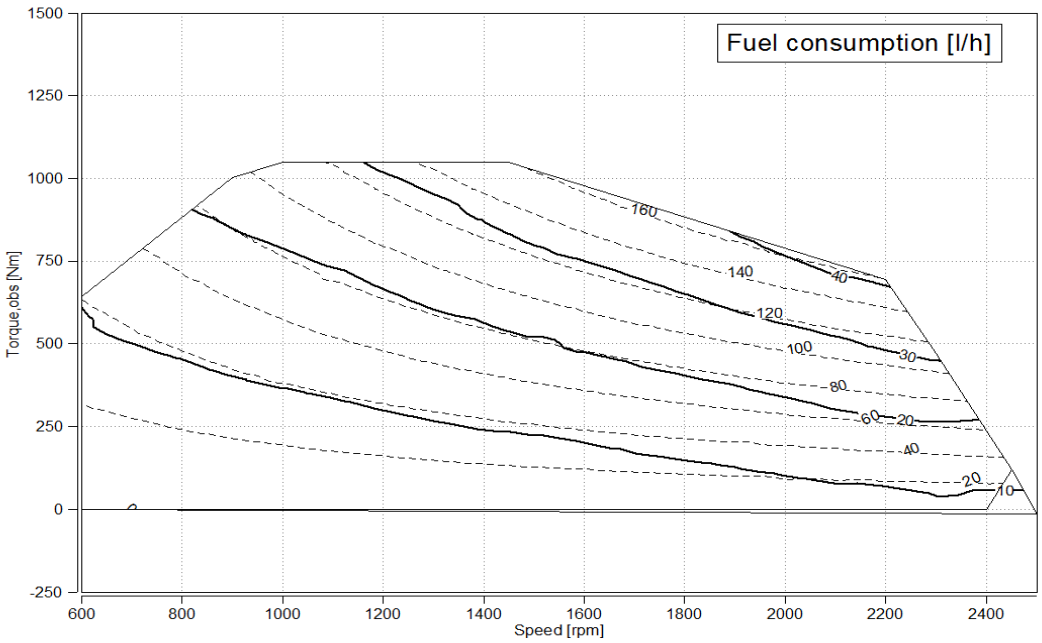


Maximum fan speed with visco clutch: 2400rpm



Maximum fan speed with visco clutch: 2400rpm


Specific fuel consumption [g/kWh]
Torque,obs [Nm]
Speed [rpm]
1500
1250
1000
750
500
250
0
-250
600
800
1000
1200
1400
1600
1800
2000
2200
2400
230
240
250
260
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10


Fuel consumption [l/h]
Torque,obs [Nm]
Speed [rpm]
1500
1250
1000
750
500
250
0
-250
600
800
1000
1200
1400
1600
1800
2000
2200
2400
160
140
120
100
80
60
40
30
20
10